

2AZ-FE ENGINE MECHANICAL

SERVICE DATA

ENGINE

Item	Condition	Specified Condition
Standard ignition timing	When using intelligent tester	5 to 15° BTDC @ idle
Standard ignition timing	When not using intelligent tester (Connect SST)	8 to 12° BTDC @ idle
Standard ignition timing	When not using intelligent tester (Disconnect SST)	5 to 15° BTDC @ idle
Standard idle speed	-	600 to 700 rpm
Compression	Standard pressure	1,300 kPa (13.8 kgf/cm ² , 196 psi)
	Minimum pressure	1,000 kPa (10 kgf/cm ² , 142 psi)
	Difference between each cylinder	100 kPa (1.0 kgf/cm ² , 14 psi)

VALVE CLEARANCE

Item	Condition	Specified Condition
Intake	Cold	0.19 to 0.29 mm (0.0075 to 0.0114 in.)
Exhaust	Cold	0.38 to 0.48 mm (0.0150 to 0.0189 in.)

TIMING CHAIN

Item	Condition	Specified Condition
Chain sub-assembly	Maximum wear	122.6 mm (4.827 in.)
Chain tensioner slipper	Maximum wear	1.0 mm (0.039 in.)
No. 1 chain vibration damper	Maximum wear	1.0 mm (0.039 in.)
Crankshaft timing sprocket	Minimum gear diameter (with chain)	51.6 mm (2.031 in.)
Oil pump drive sprocket	Minimum gear diameter (with chain)	48.2 mm (1.898 in.)
Oil pump drive shaft sprocket	Minimum gear diameter (with chain)	48.2 mm (1.898 in.)

CYLINDER HEAD

Item	Condition	Position	Specified Condition
Cylinder head	Maximum warpage	-	0.08 mm (0.0032 in.)
Camshaft (Intake)	Maximum circle runout	-	0.03 mm (0.0012 in.)
	Standard cam lobe height	-	47.306 to 47.406 mm (1.8624 to 1.8664 in.)
	Minimum cam lobe height	-	47.196 mm (1.8581 in.)
	Standard journal diameter	No. 1 journal	35.971 to 35.985 mm (1.4162 to 1.4167 in.)
	Standard journal diameter	Other journal	22.959 to 22.975 mm (0.9039 to 0.9045 in.)
	Standard oil clearance	No. 1 journal	0.007 to 0.038 mm (0.0003 to 0.0015 in.)
	Maximum oil clearance		0.07 mm (0.0028 in.)
	Standard oil clearance	Other journal	0.025 to 0.062 mm (0.0010 to 0.0024 in.)
	Maximum oil clearance		0.10 mm (0.0039 in.)
	Standard thrust clearance	-	0.040 to 0.095 mm (0.0016 to 0.0037 in.)
	Maximum thrust clearance	-	0.11 mm (0.0043 in.)

Item	Condition	Position	Specified Condition
No. 2 camshaft (Exhaust)	Maximum circle runout	-	0.03 mm (0.0012 in.)
	Standard cam lobe height	-	45.983 to 46.083 mm (1.8104 to 1.8143 in.)
	Minimum cam lobe height	-	45.873 mm (1.8060 in.)
	Standard journal diameter	No. 1 journal	35.971 to 35.985 mm (1.4162 to 1.4167 in.)
	Standard journal diameter	Other journal	22.959 to 22.975 mm (0.9039 to 0.9045 in.)
	Standard oil clearance	No. 1 journal	0.040 to 0.079 mm (0.0016 to 0.0031 in.)
	Maximum oil clearance		0.10 mm (0.0039 in.)
	Standard oil clearance	Other journal	0.025 to 0.062 mm (0.0010 to 0.062 in.)
	Maximum oil clearance		0.10 mm (0.0039 in.)
	Standard thrust clearance	-	0.080 to 0.135 mm (0.0032 to 0.0053 in.)
	Maximum thrust clearance	-	0.15 mm (0.0059 in.)
Valve lifter	Standard lifter diameter	-	30.966 to 30.976 mm (1.2191 to 1.2195 in.)
	Standard lifer bore diameter	-	31.009 to 31.025 mm (1.2208 to 1.2215 in.)
	Standard oil clearance	-	0.033 to 0.059 mm (0.0013 to 0.0023 in.)
	Maximum oil clearance	-	0.079 mm (0.0031 in.)
Inner compression spring	Standard free length	-	47.43 mm (1.8673 in.)
	Maximum deviation	-	1.6 mm (0.063 in.)
	Maximum angle (Reference)	-	2°
Intake valve	Standard overall length	-	101.71 mm (4.0043 in.)
	Minimum overall length	-	101.21 mm (3.9846 in.)
	Standard valve stem diameter	-	5.470 to 5.485 mm (0.2154 to 0.2159 in.)
	Standard valve head margin thickness	-	1.25 mm (0.0492 in.)
	Minimum valve head margin thickness	-	1.05 mm (0.0413 in.)
Exhaust valve	Standard overall length	-	101.15 mm (3.9823 in.)
	Minimum overall length	-	100.70 mm (3.9646 in.)
	Standard valve stem diameter	-	5.465 to 5.480 mm (0.2152 to 0.2158 in.)
	Standard valve head margin thickness	-	1.40 mm (0.0551 in.)
	Minimum valve head margin thickness	-	1.20 mm (0.0472 in.)

Item	Condition	Position	Specified Condition
Intake valve guide bush	Standard bush bore diameter (For cylinder head)	-	10.285 to 10.306 mm (0.4049 to 0.4058 in.)
	Standard valve guide bush diameter	STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
		O/S (0.05 mm)	10.383 to 10.394 mm (0.4088 to 0.4092 in.)
	Standard bush inside diameter	-	5.510 to 5.530 mm (0.2169 to 0.2177 in.)
	Standard oil clearance	-	0.025 to 0.060 mm (0.0010 to 0.0024 in.)
	Maximum oil clearance	-	0.08 mm (0.0032 in.)
	Standard protrusion height	-	9.6 to 10.0 mm (0.378 to 0.394 in.)
Exhaust valve guide bush	Standard bush bore diameter (For cylinder head)	-	10.285 to 10.306 mm (0.4049 to 0.4058 in.)
	Standard valve guide bush diameter	STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
		O/S (0.05 mm)	10.383 to 10.394 mm (0.4088 to 0.4092 in.)
	Standard bush inside diameter	-	5.510 to 5.530 mm (0.2169 to 0.2177 in.)
	Standard oil clearance	-	0.030 to 0.065 mm (0.0012 to 0.0026 in.)
	Maximum oil clearance	-	0.10 mm (0.004 in.)
	Standard protrusion height	-	9.6 to 10.0 mm (0.378 to 0.394 in.)
Cylinder head set bolt	Standard bolt length	-	141.3 to 142.7 mm (5.563 to 5.618 in.)
	Maximum bolt length	-	144.2 mm (5.677 in.)
Exhaust manifold	Maximum warpage	-	0.70 mm (0.028 in.)
Ring pin	Protrusion height	-	3.0 mm (0.12 in.)

ENGINE UNIT

Item	Condition	Mark	Specified Condition
Balance shaft	Standard thrust clearance	-	0.05 to 0.09 mm (0.0020 to 0.0035 in.)
	Maximum thrust clearance	-	0.09 mm (0.0035 in.)
	Standard oil clearance	-	0.004 to 0.049 mm (0.0002 to 0.0019 in.)
	Maximum oil clearance	-	0.049 mm (0.0019 in.)
	Standard journal diameter	-	22.985 to 23.000 mm (0.9049 to 0.9055 in.)
	Standard balance shaft housing journal bore diameter	Mark 1	6.000 to 26.006 mm (1.0236 to 1.0239 in.)
		Mark 2	26.007 to 26.012 in.)
		Mark 3	26.013 to 26.018 in.)
	Standard bearing center wall thickness	Mark 1	1.486 to 1.489 mm (0.05850 to 0.05862 in.)
		Mark 2	1.490 to 1.492 mm (0.05866 to 0.05874 in.)
		Mark 3	1.493 to 1.495 mm (0.0585 to 0.0586 in.)

Item	Condition	Mark	Specified Condition
Connecting rod	Standard thrust clearance	-	0.160 to 0.362 mm (0.0063 to 0.0143 in.)
	Maximum thrust clearance	-	0.362 mm (0.0143 in.)
	Standard oil clearance	-	0.024 to 0.048 mm (0.0009 to 0.0019 in.)
	Maximum oil clearance	-	0.08 mm (0.0032 in.)
	Standard large end bore diameter	Mark 1	51.000 to 51.007 mm (2.0079 to 2.0082 in.)
		Mark 2	51.008 to 51.013 mm (2.0082 to 2.0084 in.)
		Mark 3	51.014 to 51.020 mm (2.0084 to 2.0087 in.)
	Standard bearing thickness	Mark 1	1.485 to 1.488 mm (0.0585 to 0.0586 in.)
		Mark 2	1.489 to 1.491 mm (0.0586 to 0.0587 in.)
		Mark 3	1.492 to 1.494 mm (0.0587 to 0.0588 in.)
	Standard crankshaft pin diameter	-	47.990 to 48.000 mm (1.8894 to 1.8898 in.)
Crankshaft	Standard thrust clearance	-	0.04 to 0.24 mm (0.0016 to 0.0095 in.)
	Maximum thrust clearance	-	0.30 mm (0.0118 in.)
	Standard oil clearance	-	0.008 to 0.024 mm (0.0003 to 0.0010 in.)
	Maximum oil clearance	-	0.050 mm (0.0020 in.)
Crankshaft	Standard cylinder block journal bore diameter	Mark 0	59.000 to 59.002 mm (2.3228 to 2.3229 in.)
		Mark 1	59.003 to 59.004 mm (2.3230 to 2.3230 in.)
		Mark 2	59.005 to 59.006 mm (2.3230 to 2.3231 in.)
		Mark 3	59.007 to 59.009 mm (2.3231 to 2.3232 in.)
		Mark 4	59.010 to 59.011 mm (2.3232 to 2.3233 in.)
		Mark 5	59.012 to 59.013 mm (2.3233 to 2.3234 in.)
		Mark 6	59.014 to 59.016 mm (2.3234 to 2.3235 in.)
Crankshaft	Standard crankshaft journal diameter	Mark 0	54.999 to 55.000 mm (2.1653 to 2.1654 in.)
		Mark 1	54.997 to 54.998 mm (2.1652 to 2.1653 in.)
		Mark 2	54.995 to 54.996 mm (2.1652 to 2.1652 in.)
		Mark 3	54.993 to 54.994 mm (2.1651 to 2.1651 in.)
		Mark 4	54.991 to 54.992 mm (2.1650 to 2.1650 in.)
		Mark 5	54.988 to 54.990 mm (2.1649 to 2.1650 in.)

Item	Condition	Mark	Specified Condition
Crankshaft	Standard bearing center wall thickness	Mark 1	1.993 to 1.996 mm (0.0785 to 0.0786 in.)
		Mark 2	1.997 to 1.999 mm (0.0786 to 0.0787 in.)
		Mark 3	2.000 to 2.002 mm (0.0787 to 0.0788 in.)
		Mark 4	2.003 to 2.005 mm (0.0789 to 0.0789 in.)
Crankshaft	Standard main journal diameter	-	54.988 to 55.000 mm (2.1830 to 2.1654 in.)
	Standard main journal diameter (Reference)	Mark 0	54.999 to 55.000 mm (2.1653 to 2.1654 in.)
		Mark 1	54.997 to 54.998 mm (2.1652 to 2.1653 in.)
		Mark 2	54.995 to 54.996 mm (2.1652 to 2.1652 in.)
		Mark 3	54.993 to 54.994 mm (2.1651 to 2.1651 in.)
		Mark 4	54.991 to 54.992 mm (2.1650 to 2.1650 in.)
		Mark 5	54.998 to 54.990 mm (2.1649 to 2.1650 in.)
Crankshaft	Maximum taper and distortion (Main journal)	-	0.003 mm (0.0001 in.)
	Standard crank pin diameter	-	47.990 to 48.000 mm (1.8894 to 1.8898 in.)
	Maximum taper and distortion (Crank pin)	-	0.003 mm (0.0001 in.)
Cylinder block	Maximum warpage (Measure the warpage of the surface that is in contact with the cylinder head gasket.)	-	0.05 mm (0.0020 in.)
	Standard cylinder bore diameter	-	88.500 to 88.513 mm (3.4843 to 3.4847 in.)
	Maximum cylinder bore diameter	-	88.633 mm (3.4849 in.)
Piston	Standard diameter (Measure the position diameter at right angles to the piston pin hole, and at the piston 44.3 mm (1.7587 in.) from the piston head.)	-	88.477 to 88.487 mm (3.5125 to 3.5129 in.)
	Standard oil clearance	-	0.021 to 0.044 mm (0.0008 to 0.0017 in.)
	Maximum oil clearance	-	0.10 mm (0.0039 in.)
	Standard piston pin bore diameter	-	22.001 to 22.010 mm (0.8662 to 0.8665 in.)
	-	Mark A	22.001 to 22.004 mm (0.8662 to 0.8663 in.)
		Mark B	22.005 to 22.007 mm (0.8663 to 0.8664 in.)
		Mark C	22.008 to 22.010 mm (0.8665 to 0.8665 in.)
	Standard piston pin bore oil clearance	-	0.001 to 0.007 mm (0.00004 to 0.0003 in.)
	Maximum piston pin bore oil clearance	-	0.013 mm (0.0005 in.)

Item	Condition	Mark	Specified Condition
Piston ring	Standard ring groove clearance	No. 1 ring	0.020 to 0.070 mm (0.0008 to 0.0028 in.)
		No. 2 ring	0.020 to 0.060 mm (0.0008 to 0.0024 in.)
		Oil ring	0.020 to 0.070 mm (0.0008 to 0.0028 in.)
	Standard end gap (Measure the piston ring a little beyond the bottom of the ring travel, 110 mm (4.33 in.) from the top of the cylinder block.)	No. 1 ring	0.24 to 0.31 mm (0.0094 to 0.0122 in.)
		No. 2 ring	0.33 to 0.43 mm (0.0130 to 0.0169 in.)
		Oil ring	0.10 to 0.30 mm (0.0040 to 0.0119 in.)
	Maximum end gap	No. 1 ring	0.89 mm (0.0350 in.)
		No. 2 ring	1.37 mm (0.0539 in.)
		Oil ring	0.73 mm (0.0287 in.)
Piston pin	Standard piston pin diameter	-	21.997 to 22.006 mm (0.8660 to 0.8664 in.)
	-	Mark A	21.997 to 22.000 mm (0.8660 to 0.8661 in.)
		Mark B	22.001 to 22.003 mm (0.8662 to 0.8663 in.)
		Mark C	22.004 to 22.006 mm (0.8663 to 0.8664 in.)
Connecting rod	Standard small end bore diameter	-	22.005 to 22.014 mm (0.8663 to 0.8667 in.)
	-	Mark A	22.005 to 22.008 mm (0.8663 to 0.8665 in.)
		Mark B	22.009 to 22.011 mm (0.8665 to 0.8666 in.)
		Mark C	22.012 to 22.014 mm (0.8666 to 0.8667 in.)
	Standard small end bore oil clearance	-	0.005 to 0.011 mm (0.0002 to 0.0004 in.)
	Maximum small end bore oil clearance	-	0.017 mm (0.0007 in.)
	Maximum misalignment	-	0.05 mm (0.0020 in.) per 100 mm (3.94 in.)
	Maximum twist	-	0.15 mm (0.0059 in.) per 100 mm (3.94 in.)
Connecting rod bolt	Standard diameter (Measure the tension portion diameter of the bolt.)	-	7.2 to 7.3 mm (0.283 to 0.287 in.)
	Minimum diameter	-	7.0 mm (0.276 in.)

TORQUE SPECIFICATIONS

DRIVE BELT

Part Tightened	N*m	kgf*cm	ft.*lbf
Front suspension member reinforcement RH x Front cross member, Front suspension crossmember	96	979	71

VALVE CLEARANCE

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Part Tightened	N*m	kgf*cm	ft.*lbf
No. 1 camshaft bearing cap x Cylinder head	29.5	301	22
No. 2 camshaft bearing cap x Cylinder head	29.5	301	22
No. 3 camshaft bearing cap x Cylinder head	9.0	92	80 in.*lbf
No. 1 chain tensioner x Timing chain cover	9.0	92	80 in.*lbf

TIMING CHAIN

Part Tightened	N*m	kgf*cm	ft.*lbf
Chain tensioner plate x Crankshaft bearing cap	12	122	9
Oil pump drive shaft sprocket x Oil pump	29.5	301	22
No. 1 chain vibration damper x Cylinder head, Cylinder block	9.0	92	80 in.*lbf
Chain tensioner slipper x Cylinder head, Cylinder block	19	194	14
Timing chain guide x Crankshaft bearing cap	9.0	92	80 in.*lbf
Timing chain cover x Cylinder head, Cylinder block	Bolt A (Head: 10 mm)	9.0	92
	Bolt B (Head: 12 mm)	25	255
	Bolt C (Head: 14 mm)	55	561
	Nut	11	112
V-ribbed belt tensioner x Timing chain cover	59.5	607	44
Engine mounting bracket RH x Timing chain cover	55	561	41
Crankshaft pulley x Crankshaft	180	1,835	133
Oil pan x Stiffening crankcase	Bolt, Nut	9.0	92
Cylinder head cover x Cylinder head	Bolt A	11	112
	Bolt B	14	143
	Nut	11	112
Engine wire x Cylinder head cover	8.4	86	74 in.*lbf
Idler pulley bracket x Cylinder block	60	612	44
Engine mounting insulator FR x Front cross member	95	969	70
Engine mounting insulator FR	Through bolt x Nut	145	1,479
Engine mounting insulator RH x Body	95	969	70
Engine mounting insulator RH x Engine mounting bracket	Nut A	95	969
	Nut B	52	530
Radiator reservoir x Radiator support RH, Engine mounting insulator RH	5.0	51	44 in.*lbf
No. 1 engine cover x Cylinder head	7.0	71	62 in.*lbf

CYLINDER HEAD

Part Tightened		N*m	kgf*cm	ft.*lbf
Camshaft position sensor x Cylinder head		9.0	92	80 in.*lbf
Oil pressure switch x Cylinder head		13	133	10
Radio setting condenser x Cylinder head		10	102	7
Cylinder head set bolt Cylinder head x Cylinder block	1 st	70	714	52
	2 nd	Turn 90°	Turn 90°	Turn 90°
Camshaft timing gear x Camshaft		54	551	40
No. 2 camshaft timing sprocket x No. 2 camshaft		54	551	40
No. 1 and No. 2 camshaft bearing cap x Cylinder head		29.5	301	22
No. 3 camshaft bearing cap x Cylinder head		9.0	92	80 in.*lbf
Exhaust manifold x Cylinder head		37	377	27
No. 1 exhaust manifold heat insulator x Exhaust manifold		12	122	9
No. 1 and No. 2 manifold stay x Cylinder block, Exhaust manifold		44	449	32
Oil dipstick guide x Cylinder block		9.0	92	80 in.*lbf

ENGINE ASSEMBLY

Part Tightened		N*m	kgf*cm	ft.*lbf
Drive plate x Crankshaft		98	1,000	72
Drive shaft bearing bracket x Cylinder block		64	653	47
No. 1 and No. 2 engine hanger x Cylinder head		38	387	28
Engine mounting insulator LH x Body		95	969	70
Engine mounting insulator LH	Through bolt	56	571	41
Engine mounting insulator RH x Body		95	969	70
Engine mounting insulator RH x Engine mounting bracket	Nut A	95	969	70
	Nut B	52	530	38
Engine mounting insulator RR x Front suspension crossmember	Bolt and Nut	95	969	70
Engine mounting insulator RR x Engine mounting bracket	Though bolt	95	969	70
Engine mounting insulator FR x Front cross member		95	969	70
Engine mounting insulator FR	Though bolt	145	1,479	107
Battery carrier bracket x Body		20	204	15
Battery bracket reinforcement x Battery carrier		20	204	15
Front battery carrier x Battery bracket reinforcement		20	204	15
Air cleaner filter element x Body		5.0	51	44 in.*lbf
Radiator reservoir x Radiator support RH, Engine mounting insulator RH		5.0	51	44 in.*lbf
Battery clamp x Upper Radiator support	For bolt	8.5	87	75 in.*lbf
Battery clamp x Battery clamp bolt	For nut	5.0	51	44 in.*lbf

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ENGINE UNIT

Part Tightened		N*m	kgf*cm	ft.*lbf
Balance shaft housing x Stiffening crankcase	1 st	21.6	220	16
	2 nd	Turn 90°	Turn 90°	Turn 90°
Connecting rod bolt Connecting rod cap x connecting rod	1 st	24.5	250	18
	2 nd	Turn 90°	Turn 90°	Turn 90°
Crankshaft bearing cap set bolt Crankshaft bearing cap x Cylinder block	1 st	40	408	30
	2 nd	Turn 90°	Turn 90°	Turn 90°
Stud bolt x Cylinder block	Bolt A, C and D	5.0	51	44 in.*lbf
	Bolt B	21.5	219	16
No. 1 oil nozzle x Cylinder block		7.0	71	62 in.*lbf
Connecting rod cap x Connecting rod	1 st	24.5	250	18
	2 nd	Turn 90°	Turn 90°	Turn 90°
Stiffening crankcase x Cylinder block		24	245	18
Oil control valve filter x Cylinder block		30	306	22
Cylinder block water drain cock x Cylinder block		25	255	18
Camshaft timing oil control valve x Cylinder head		9.0	92	80 in.*lbf
Oil pan drain plug x Oil pan		40	408	30
Oil filter union x Stiffening crankcase		29.5	301	22
Oil filler cap x Cylinder head cover		3.0	31	26 in.*lbf
Spark plug x Cylinder head		25	254	18
Ventilation valve x Cylinder head cover		19	194	14
No. 3 water by-pass hose x Cylinder head		9.0	92	80 in.*lbf
No. 1 water by-pass pipe x Cylinder head		9.0	92	80 in.*lbf
Idler pulley bracket x Cylinder block		60	612	44
Union bolt	With oil cooler	25	255	18
Oil cooler pipe x Cylinder head		9.0	92	80 in.*lbf